¼ Scale P-39 Build

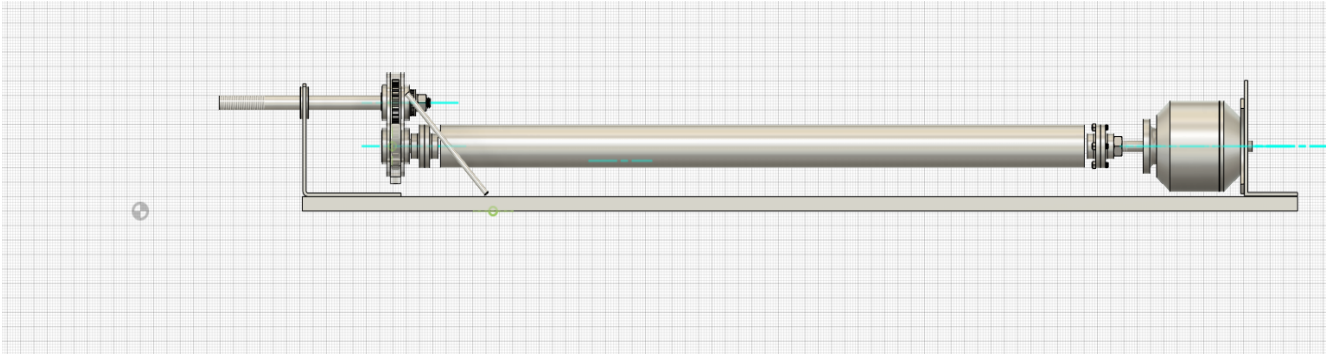
Paul Fleming and Jim Lake
12/18/2021

The Project

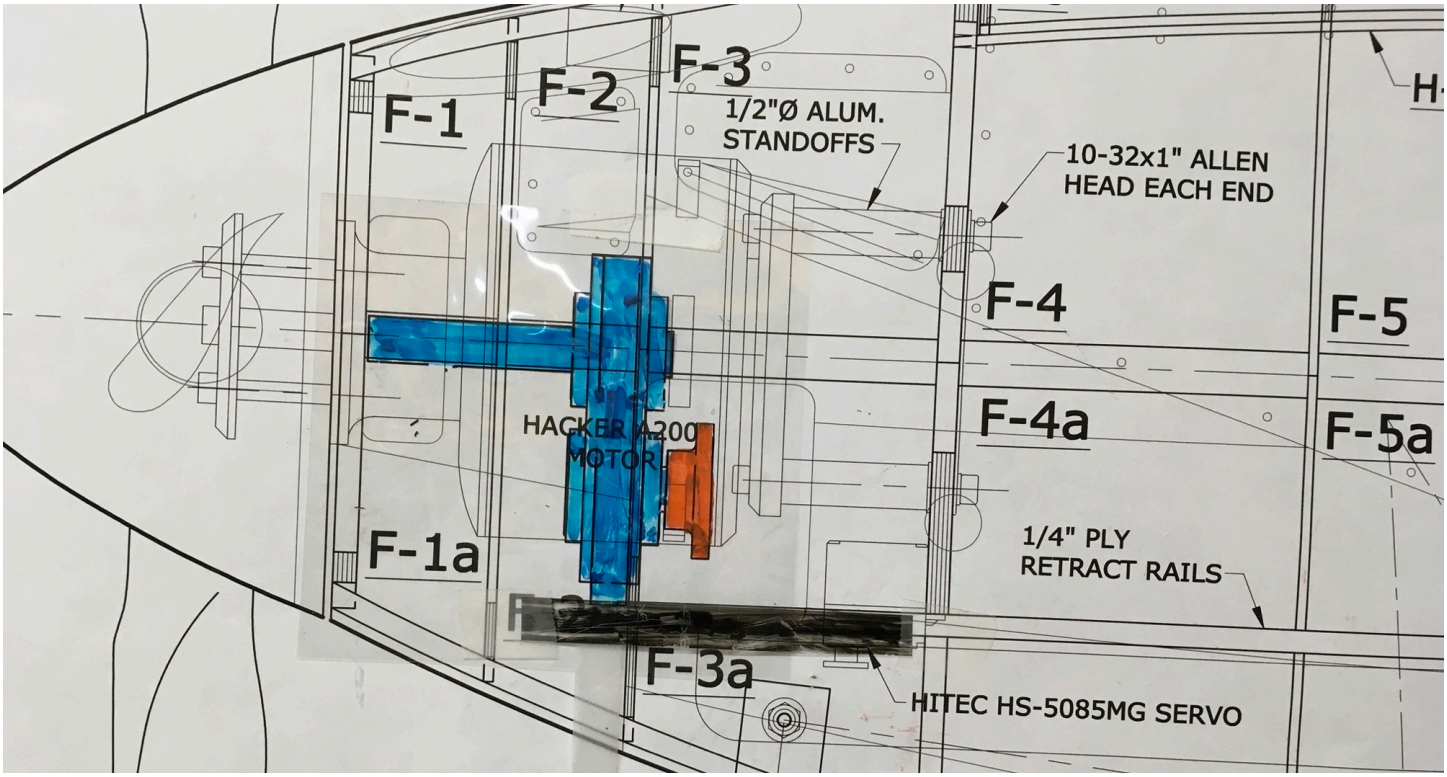
Some time back I bought partially started a 1/4 Scale Fiberglass fuselage Consolidated Models P-39 kit. I got to thinking about doing the whole mid-engine thing and how challenging that would be. I Called Jim Lake and after looking over the kit and deciding we didn't really want to do the foam core wings. How Jim envisioned installing the propulsion system wouldn't work well with the fiberglass fuselage we had, and we really didn't want to ruin this nice kit so we decided to do a full build.

I ordered a Jerry Bates P-39 plan set. It didn't take long to see Jerry's design would lend itself well to our project.

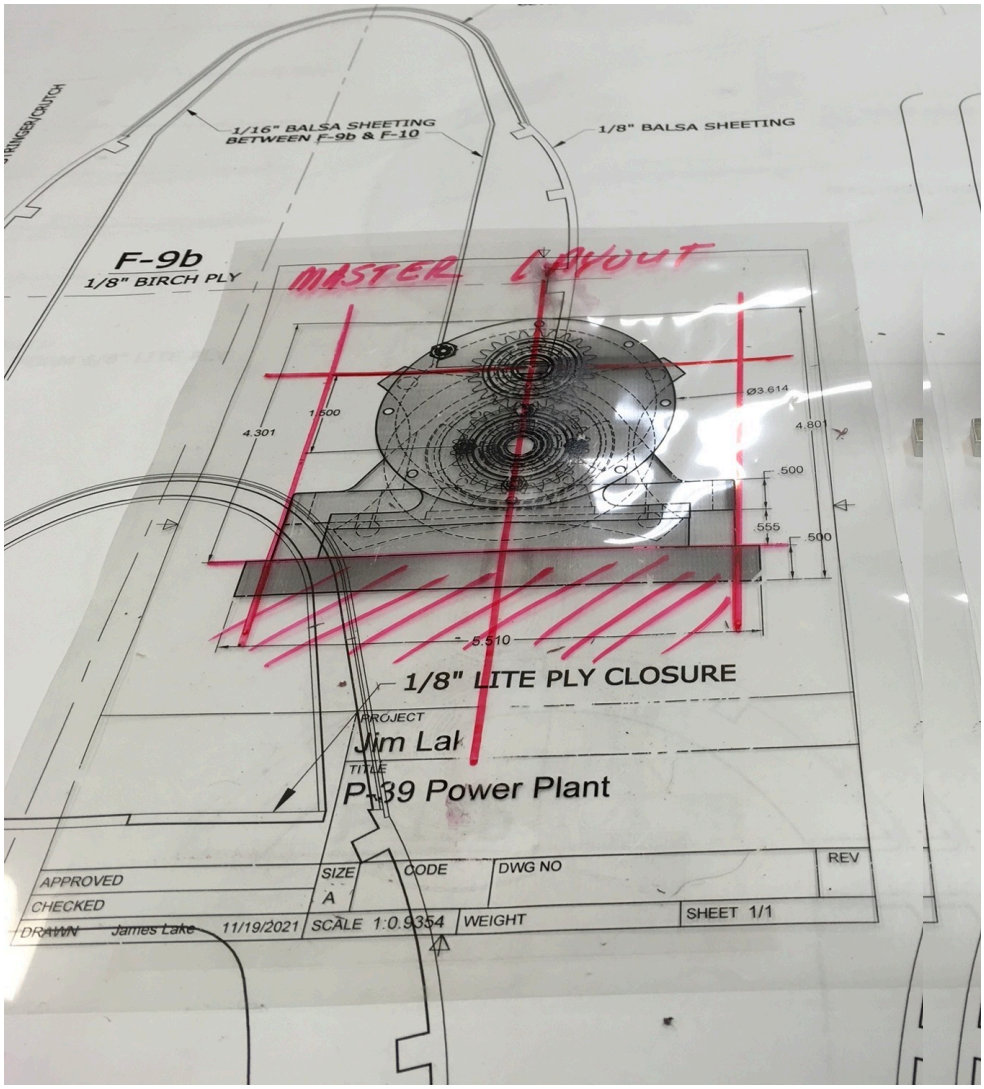
Earlier I had purchased a Rimfire 65cc motor for a Ziroli Skyraider. This would be the prefect motor for the P-39. Within a few days we had our basic layout. Jim's design would be very close to the original, motor, drive shaft, gearbox installation.



We used full scale Transparencies to show equipment arrangement and to determine where modifications to the kit that would be required.

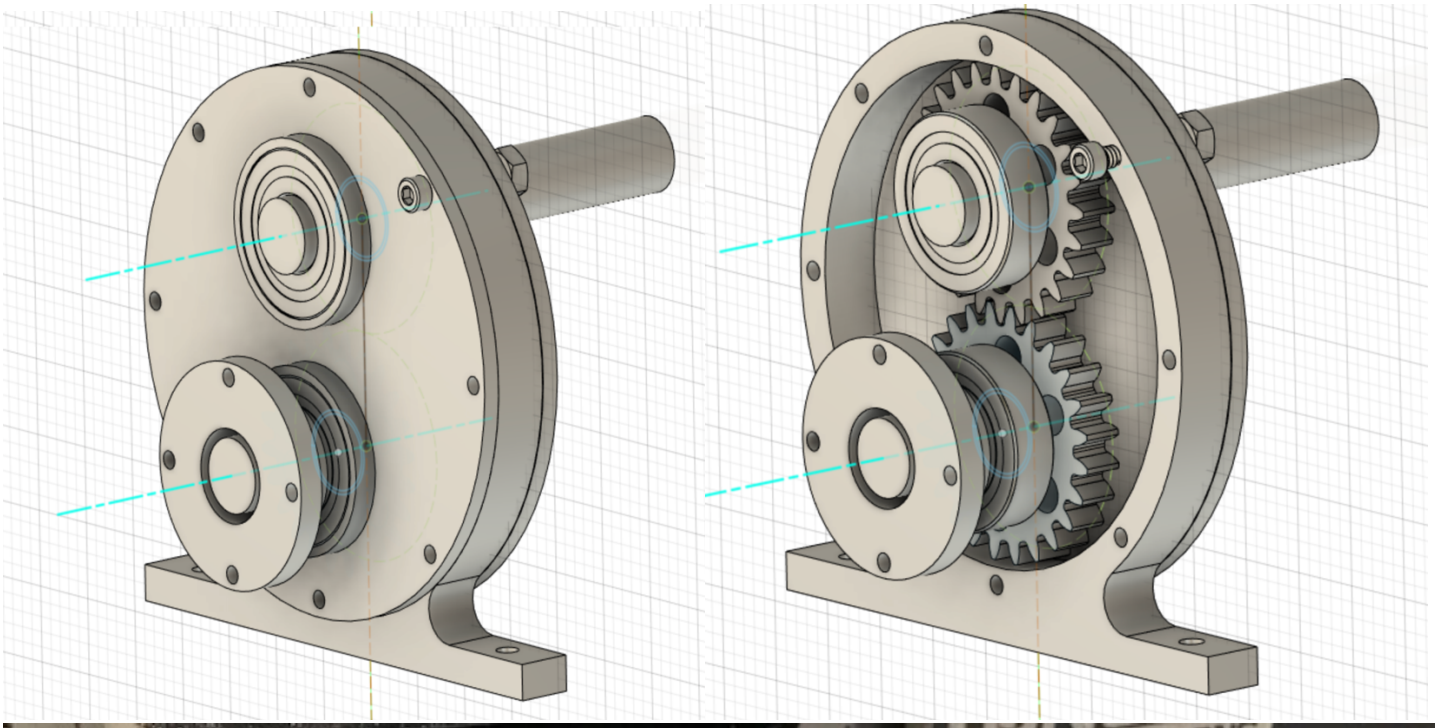


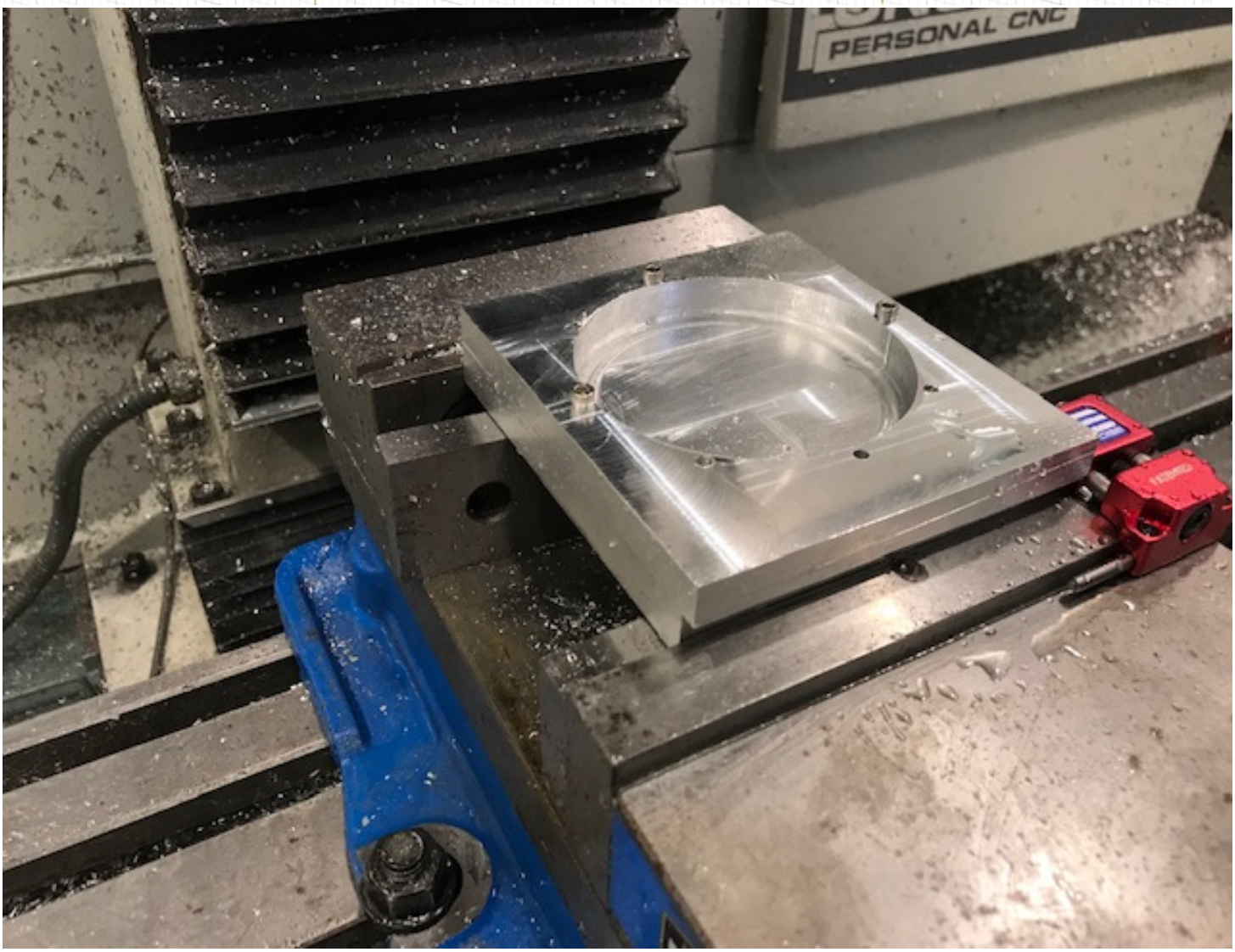
Using a full scale Gearbox and Torque Plate template over the fuselage frames we could easily see the material that needed to be removed and plot the cutting lines.

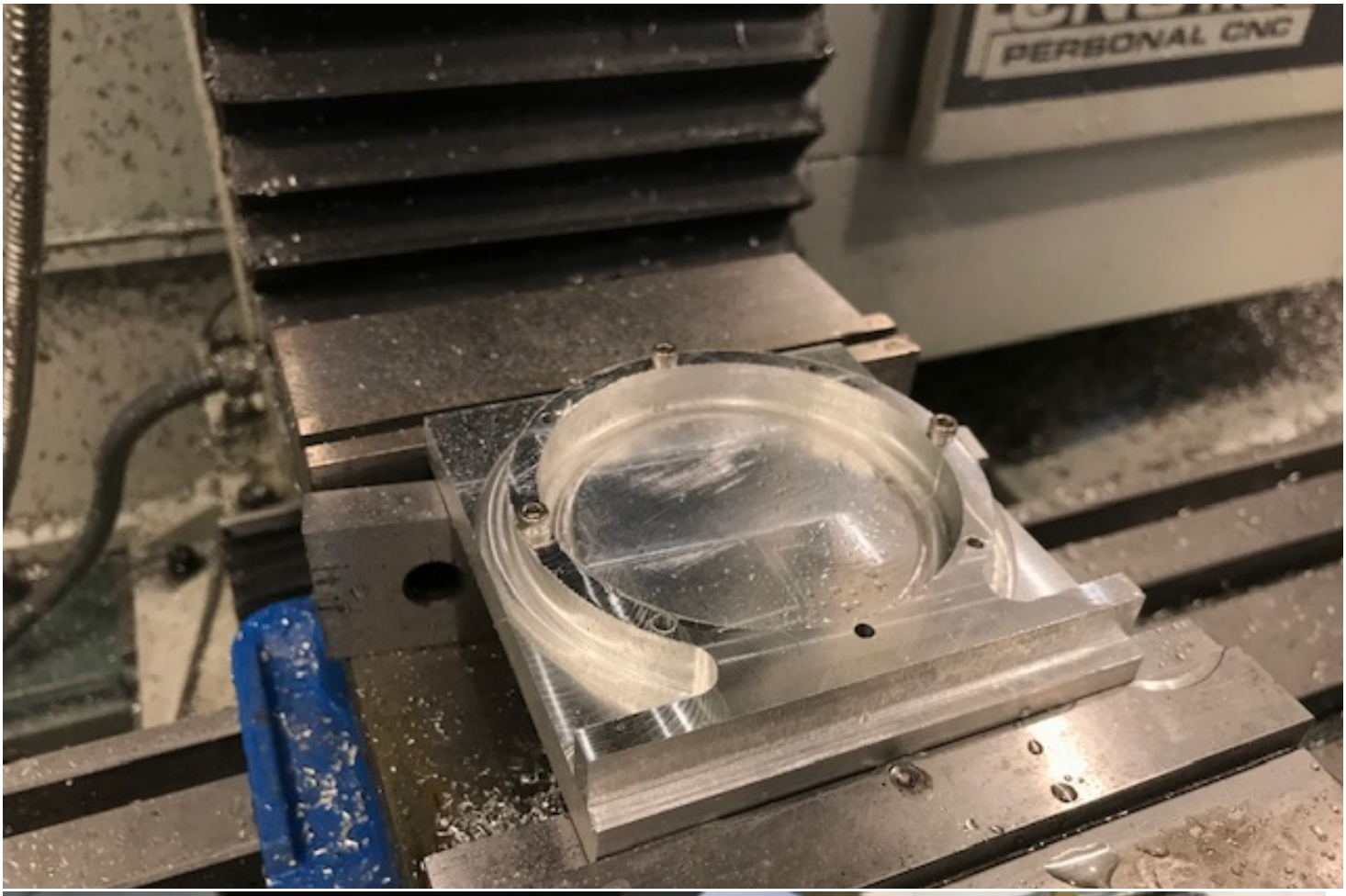


While I concentrated on preparing the fuselage frames for assembly Jim was finalizing the gearbox design. The gearbox wasn't really necessary, but the real P-39 used one and we were going to do the same. Besides it's there for bragging rights and it raises the "Cool Factor". One small point of interest here is the gears were designed for our XP-72 project and are still going strong there after three years so Jim just made another pair.

The gear box is a one-to-one ratio. It simply elevates the drive vertically 3.0 inches. On the back side of the gearbox the propeller shaft rides in the thrust bearing.




PERSONAL CNC


PERSONAL CNC

First assembly everything went together exactly as planned. The gearbox was run in the vice powered by an electric drill for about 10 minutes. No issues were noted.

In this photo shows the back side of the gearbox. The Input shaft has no coupling. The large nut holds the thrust bearing in place. After torquing it will be safety wired in place. The excess threaded rod will be cut off.

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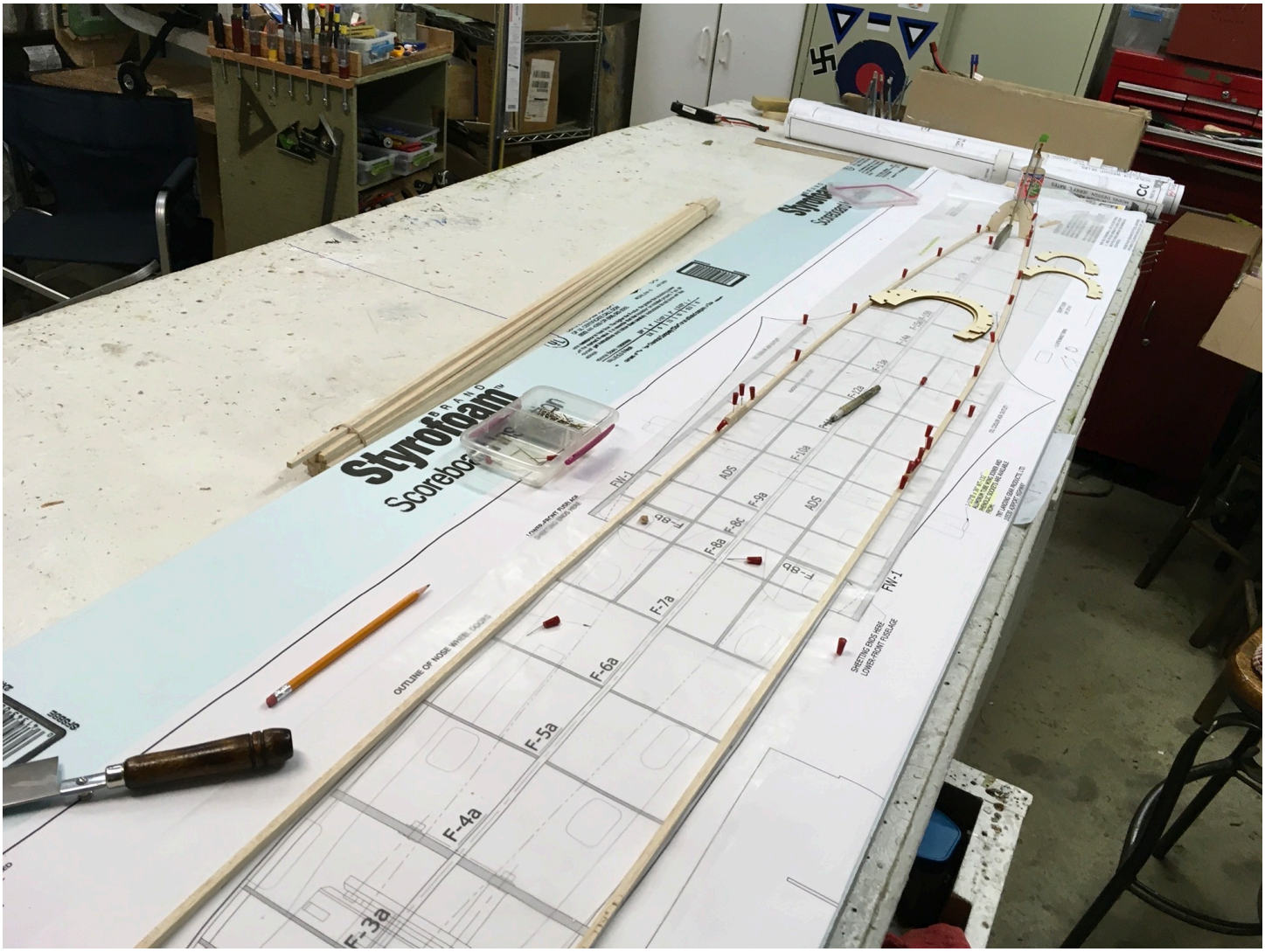
12/24/2021

Now that we have determined the final design for the Torque Plate and the internal frames have been modified I can start building the fuselage. I had ordered the kit from Lasercut USA, these guys do first rate work. Their packages arrived neatly packed and packaged to prevent shipping damage. Earlier I had laid each fuselage frames plan sheet and proceeded to inventory and package in the top and bottom halves by order of assembly. Using one gallon freezer bags to keep related parts together. I ended up with about 25 bags of parts.

This kit is designed to have the fuselage built in an upper and lower half. I decided to build the bottom half first since 90 percent of the modifications are going to take place in that part of the airplane and it would be a while before we even needed to think about the top.

My building board is a 36” x 96” x 2” thick sheet of insulating foam. I folded the plans in half, covered the fuselage outline with waxed paper and started pinning down the ¼” x ¼” balsa stringers.



This fuselage splits and identifies top and bottom of each individually numbered frame. Example F-1 and F-1a, everything that has a letter after the number is on the bottom half of the fuselage. It is a very simple easy to follow method.

For assembly I am using Super Phatic alipahayic glue. It dries fairly quickly, claims to produce tougher joints then cyano. It comes in 50ml bottles with a nice metal applicator needle. I have been using it for years, but it is not as fast as cyano and it is about half the price.

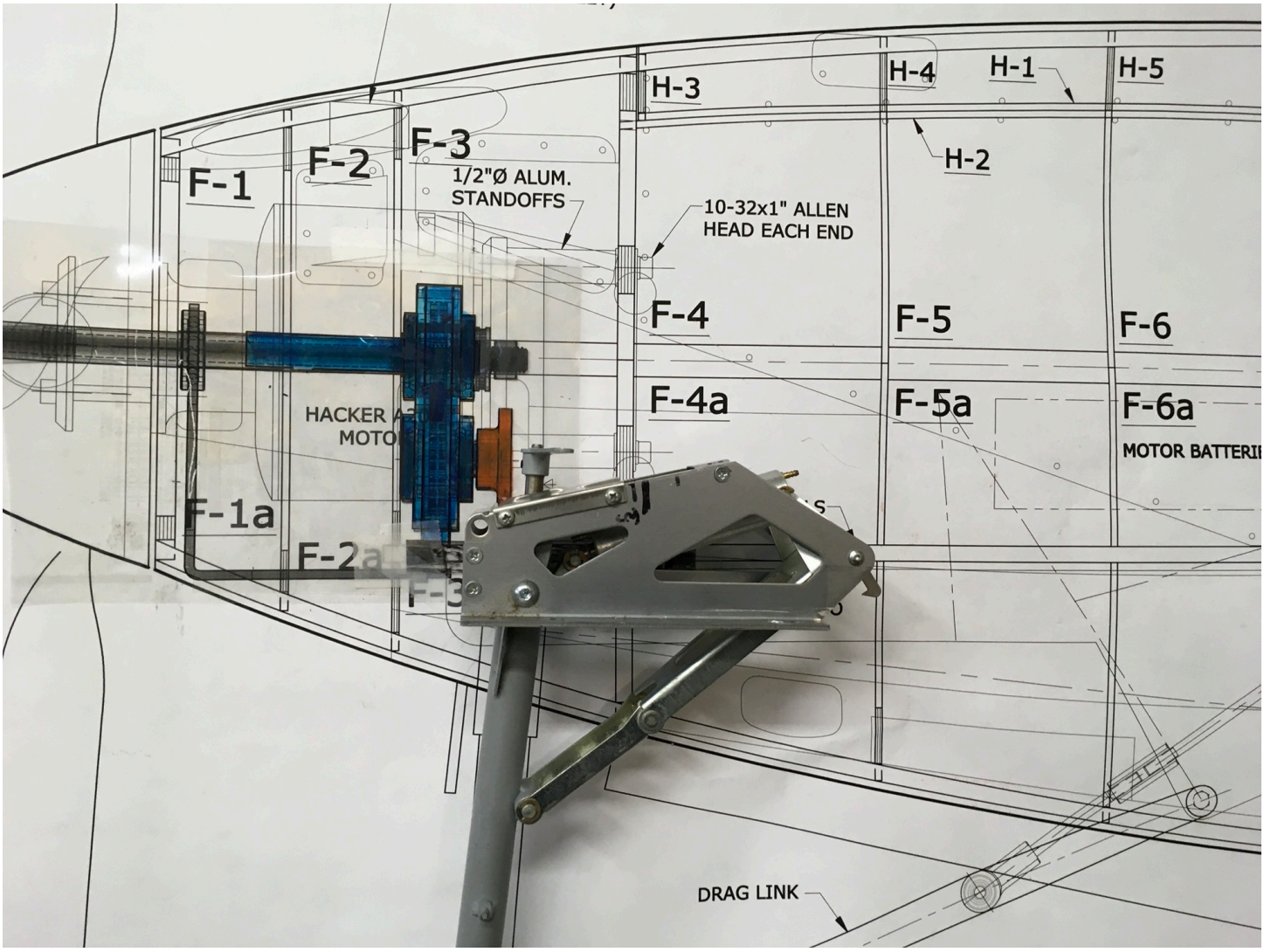
What I really like about this kit is how well everything fits together. Everything appears to line up like it is supposed to.

This airplane has some very sharp contours to follow and the ¼ square balsa stringers will break when forced. Also the stringers want to return to their original shape and the stress of several doing so can cause the fuselage to twist and distort. The simple solution is to stress relieve them by several half depth cross cuts. I made a simple cutting jig from scraps. My stringers are ¼" and I wanted to cut only half way through so I used a 1/8" scrap as my cutting stop.

I tried cutting both inside and outside of the curve. I think cutting inside worked best. It is my intention to apply some glue to cuts later.

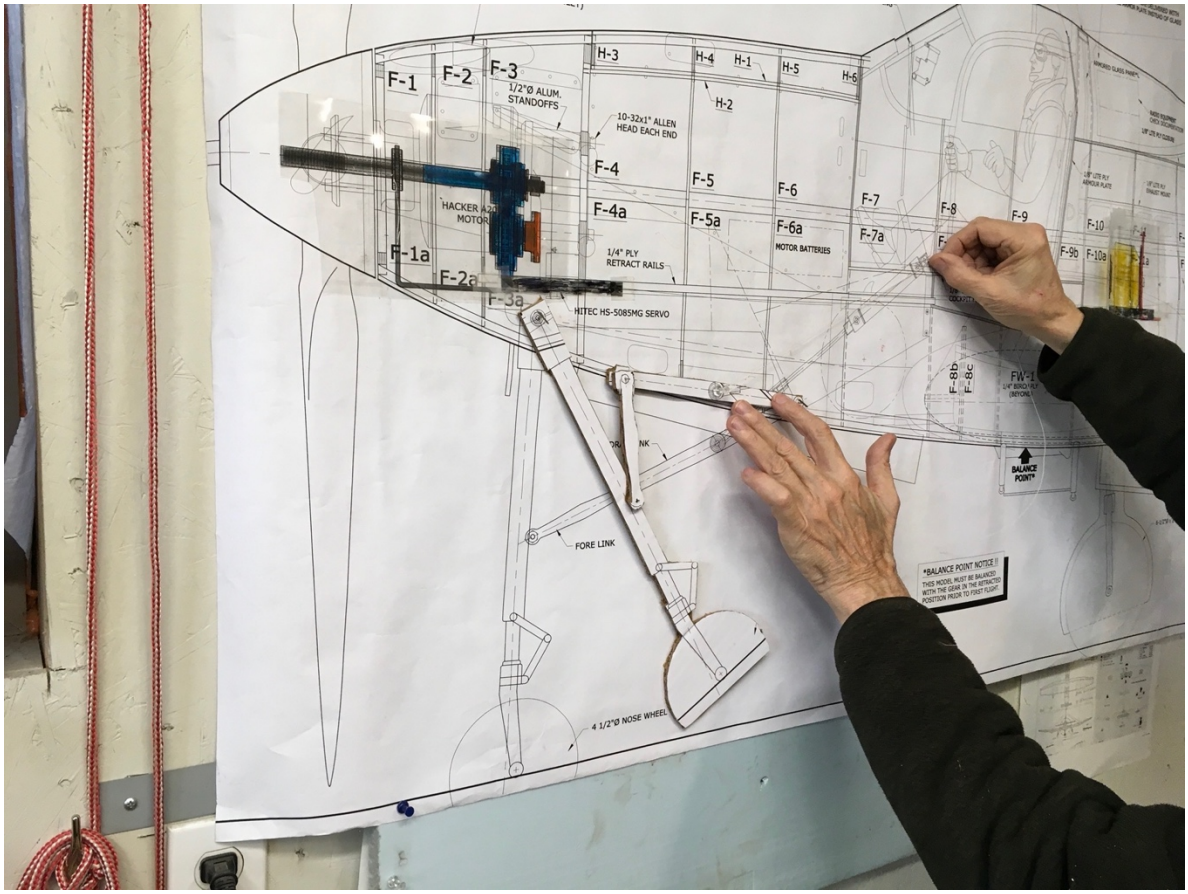
It is important the stress induced by the stringers not lift the bottom plate off the building board.

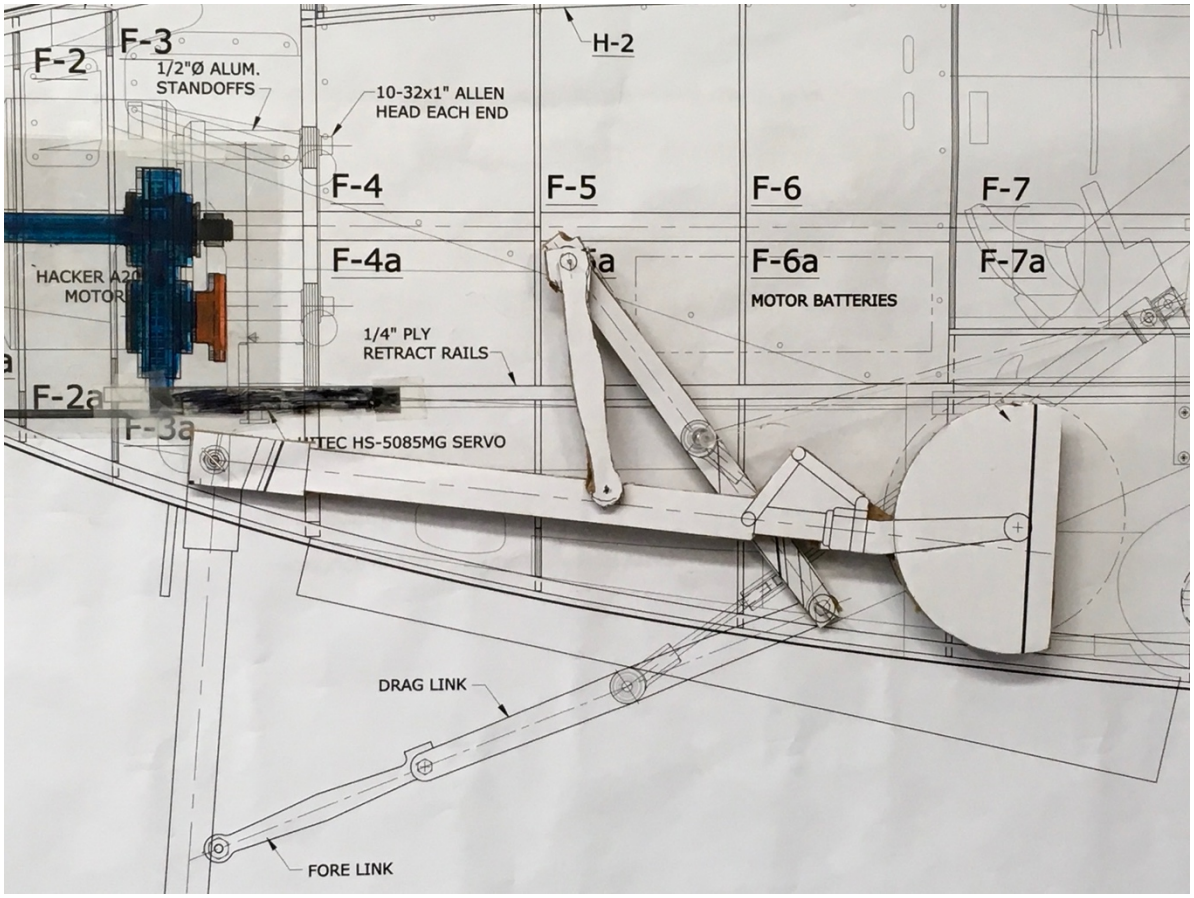
While sitting in the shop looking at the plans on the wall I realized we had a problem with the Robart landing gear. We had a serious space conflict with the Torque Plate, drive shaft and steering.



Since the actuator and steering arm were simply not going to work we decided to mount the nose gear to the bottom of the Torque Plate. How to pivot the gear leg up and steer via cables were easy. Building pieces to make this work were straight forward enough, but how are we going to get it to move. The plans show a type of gear retraction parts. I think this might be a Century Jet Unit. As shone nose gear installed which roughly duplicated the way Bell Aircraft did it.

Jim made a cardboard template of the gear parts shown and we determined the way the Century Jet gear retracted there would be space conflicts with the Torque Plate and other issues we didn't want to work around. The easiest way is to design and build our own gear.


F-1
F-2
F-3
1/2"Ø ALUM. STANDOFFS
10-32x1" ALLEN HEAD EACH END
H-3
H-4
H-1
H-5
H-6
H-2
F-4
F-5
F-6
F-7
F-8
F-9
F-10
F-9b
F-10a
F-4a
F-5a
F-6a
MOTOR BATTERIES
F-7a
HACKER A20 MOTOR
F-1a
F-2a
F-3a
1/4" PLY RETRACT RAILS
HITEC HS-5085MG SERVO
F-8b
F-8c
FW-1
BALANCE POINT
FORE LINK
*BALANCE POINT NOTICE !!
4 1/2"Ø NOSE WHEEL


F-2
F-3
1/2"Ø ALUM. STANDOFFS
10-32x1" ALLEN HEAD EACH END
H-2
F-4
F-5
F-6
F-7
F-4a
F-6a
F-7a
MOTOR BATTERIES
HACKER A20 MOTOR
1/4" PLY RETRACT RAILS
F-2a
F-3a
TEC HS-5085MG SERVO
DRAG LINK
FORE LINK

The template idea worked very well we changed pivot points, part lengths, actuator locations until we understood each issue and resolved them. One of the things that was helpful in understanding Bell's nose gear was an installation and repair manual. When you can see the shape of the actual parts that can solve many problems. I subscribe to Air Corps Library https://app.aircorpslibrary.com where you can read or download all manner of manuals on almost all US WW II airplanes.

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Merry Christmas Everyone

¼ Scale P-39 Build. 3

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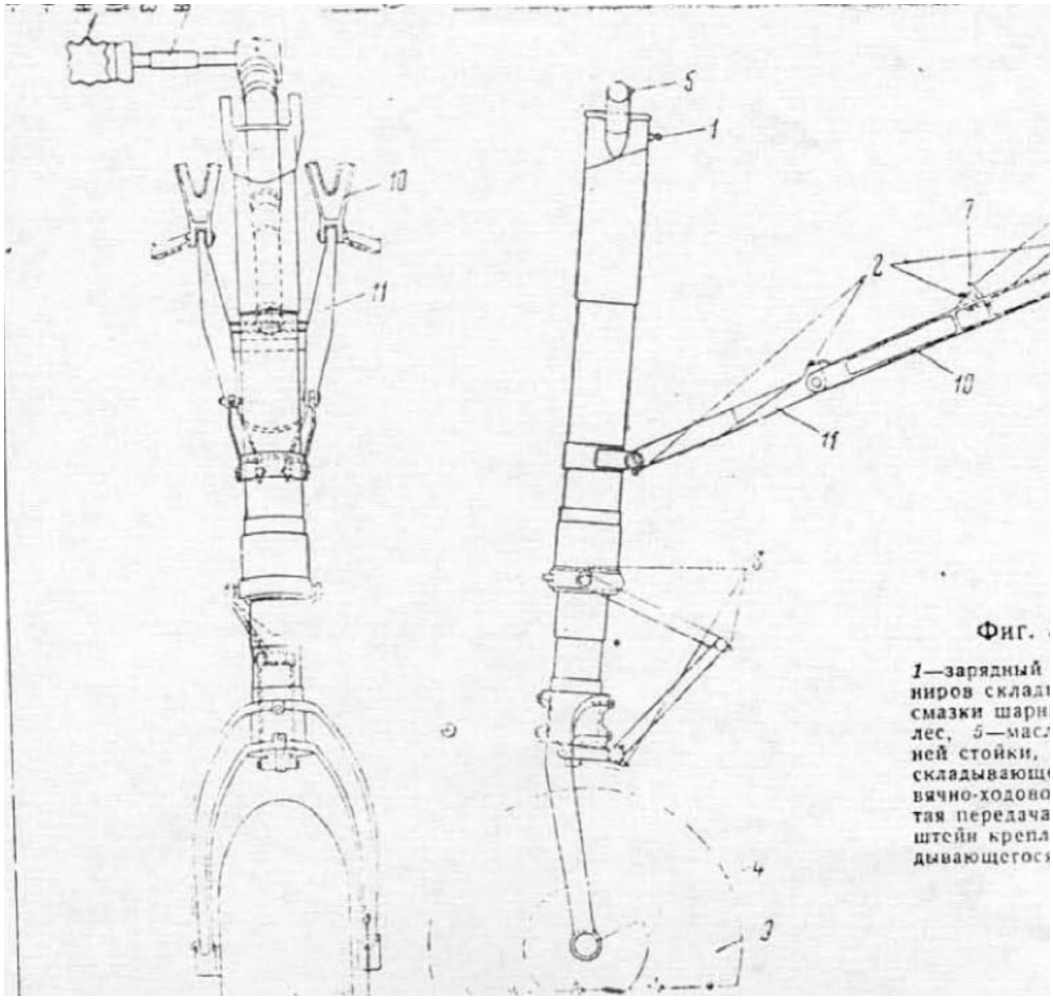
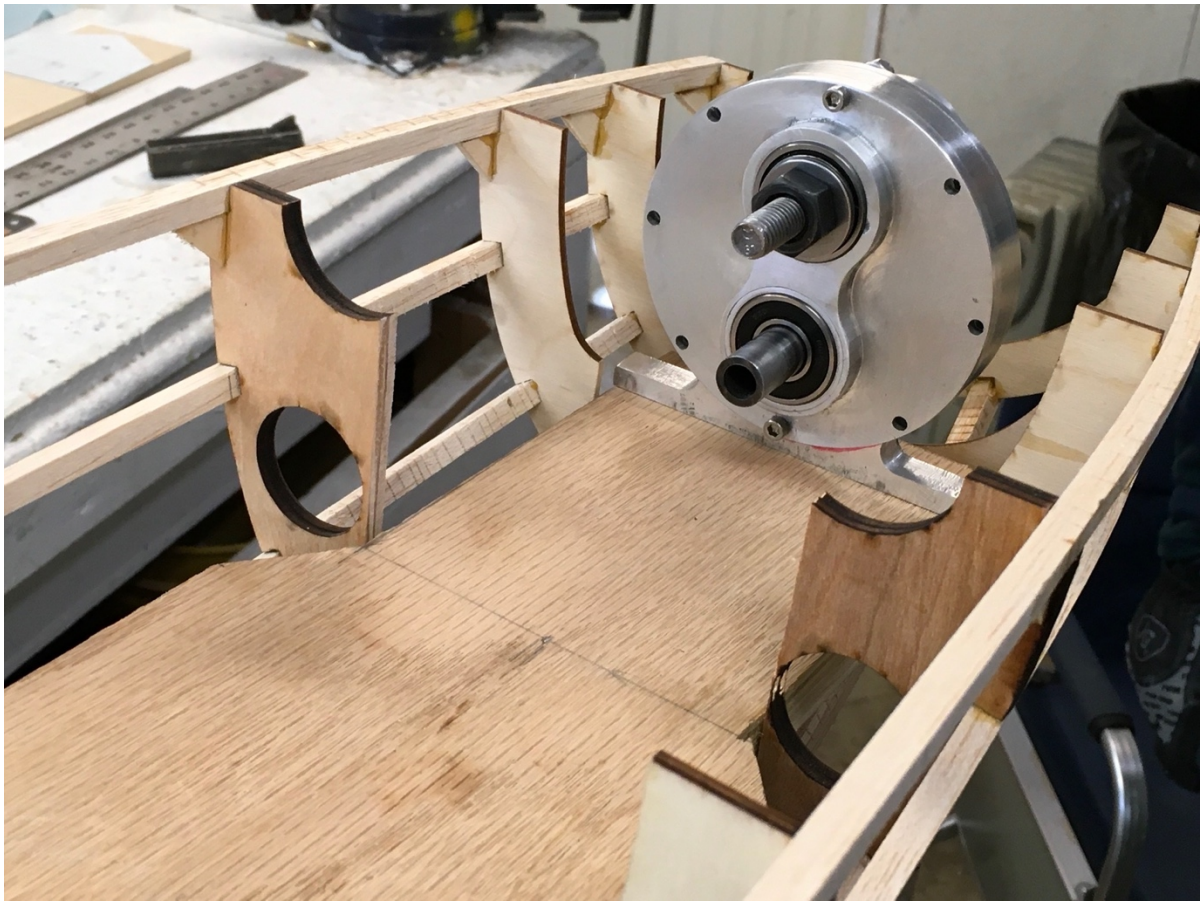
1/4/2022

While researching the P-39 nose gear I found a Bell Aircraft manual that contained a drawing of Bell's linkage this confirmed how we thought the linkage folded up during the retraction process.

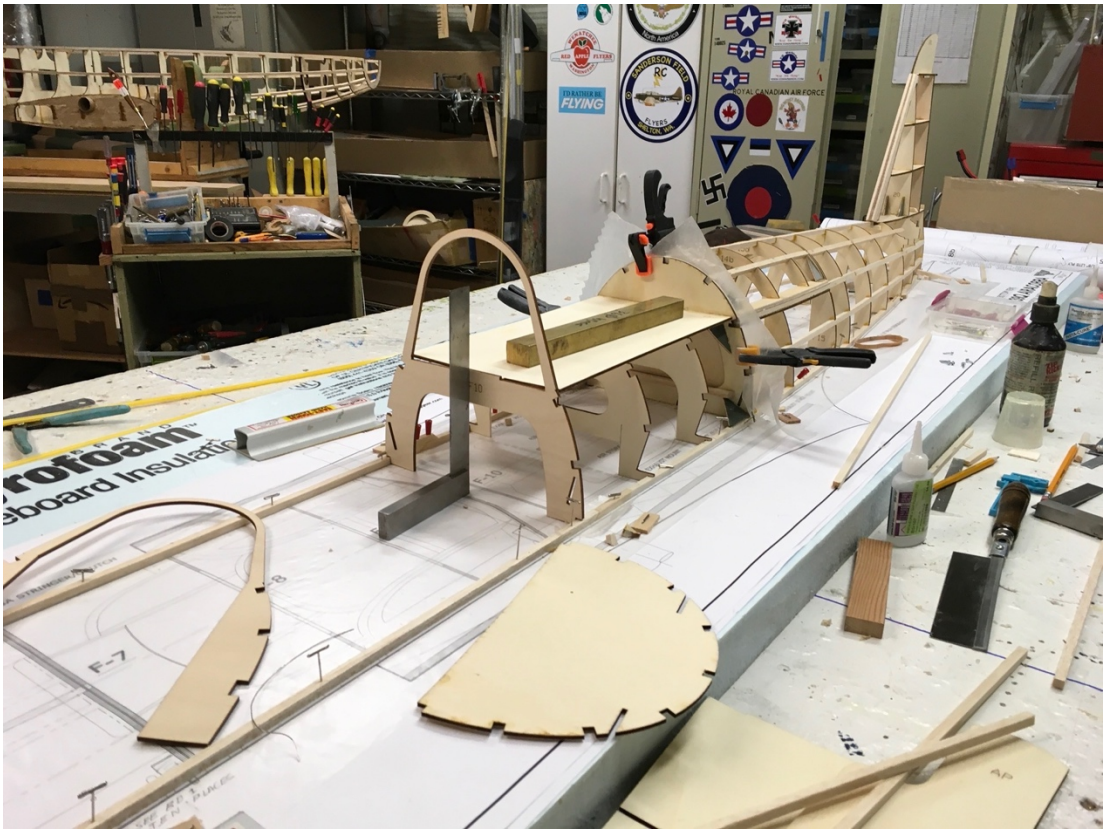


This was the most critical piece of the puzzle. The next step is to figure out the exact part dimensions and apply them to the engineering model in Fusion 360. Once Jim gets all the interference and conflicts worked out we can start building parts.

In the first issue of this Build Report I talked about the Torque Plate (TP). This is a 5.5” wide ½” sheet of balsa wood with .030 7075 aluminum sheet laminated in top and bottom. Building it thusly we have the strength and rigidity we need with minimal weight. Presently we are using a wooden mock of the TP to determine mounting and clearance issues. At this point we have noticed some slight deforming of the fuselage due to no external skin. Once we get a few of the nose gear mounting issues worked out we will reinstall the bottom of the fuselage on the building board . Using 1/8” balsa to sheet with epoxy glass we will get it trued up again.



One of the requirements of this propulsion system is it must be able to run on our test stand independent of the airframe. Which drive the requirement it must be easily removable. One of the main reasons we selected the Jerry Bates kit was it is built in an upper and lower halves. My plan is to split the upper half just aft of the canopy. The rear portion of the upper half is finished and I have installed solid bulkheads where the parting takes place. Before I glue the remaining upper frames in I will add a ¼” hardwood stringer inside the ¼” balsa mounting stringer just to stiffen things up a little.



I have been planning to finish the aft upper fuselage, but discovered I am missing a couple of critical parts for installing the horizontal stabilizers. It is my intention t get the flight control linkage installed before I sheet the tail. That is all for now, videos in the works.